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REMOVAL OF M157 CASE MATERIAL FROM BASE OF
PROJECTILE 152 MM SERIES



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JULY 1976

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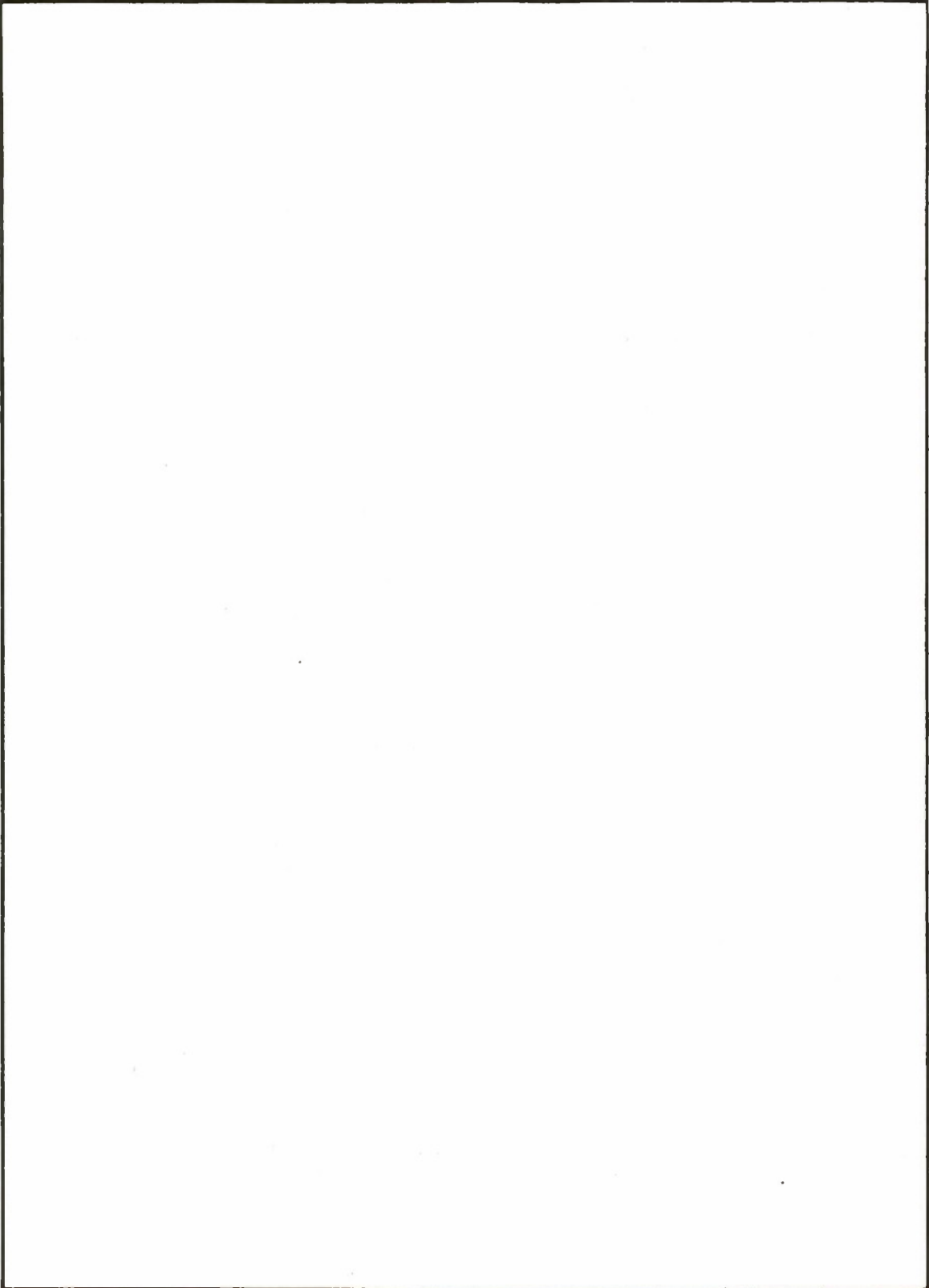
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A method for removal of residual M157 case material and epoxy from the base of the projectile 152 mm series was sought. Several approaches were considered and rejected. Finally, removal by wire brush was considered most feasible.		

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INTRODUCTION

In new production, the M157 nonmetallic cartridge case has been replaced by the high density M205 case. However, a significant quantity of M157 cartridge cases previously assembled to the projectile 152 mm is still in stores. The decision to upgrade these cartridges has led to the problem of case removal from the projectile at Iowa Army Ammunition Plant (IAAP). Their removal procedure was to cut away the case behind the projectile shoulder (Fig 1). This left the epoxied dome attached to the base of the projectile which was then removed by hand chipping and/or the application of epoxy stripper to the projectile base (Appendix). This method was messy, inefficient, time consuming, and hazardous. During 1973 Picatinny Arsenal (PTA) initiated a program to replace that manual procedure with an acceptable production method for case removal.

METHODS

The following methods were considered:

a. Immersing the projectile base in liquid nitrogen for a short period of time (approximately 60 seconds). It was hoped the different rates of contraction of steel and brittle epoxy, respectively, would effect a separation of the case material from the base. Results of this test, run on several samples, were negative.

b. A cutting tool shaped to conform to the base profile was considered as was a similarly formed milling head. Measurements of the projectile base from the several different manufacturers revealed significant variations in base profiles, which caused the tool either to cut into the projectile or, conversely, to skip over areas of the epoxy.

c. Consideration was then given to flexible cutting edges, i.e., wire brushes. Accordingly, a wire cup brush, 5 inches in diameter, .020 wire No. 3611 (Milwaukee Brush Manufacturing Company) (Fig 2), coupled to a 5500 rpm milling machine (U.S. Quarlet Company) removed case material and epoxy effectively. However, the brush loaded rapidly with case material, which could be removed only by dissolving in MS-110 epoxy stripper, a rather messy process.

d. Tests were then conducted with metal center wire wheel brushes, .014 wire, tempered, 3 inches in diameter (Milwaukee Brush Manufacturing Company) assembled in a group to a 3/4 inch shaft. This group was formed by four individual brushes strongly compressed by a nut threaded to the 3/4 inch shaft so as to form a single brush with a cutting face 1-1/2 inches wide. The face was contoured on a grinding wheel to conform with the shape of the base.

e. The brush was coupled to a Rotor Tool Company grinder Model 809, air-driven at 6,000 rpm, mounted on the tool post. The projectile was chucked in a Monarch size 20 lathe and rotated at 24 rpm (Fig 3). The center line of the brush-grinder combination was located 3/8 inch above the center line of the projectile and skewed 10 degrees horizontally counterclockwise (Figs 4 and 5). Water was directed at the base in a small stream (not shown in figure).

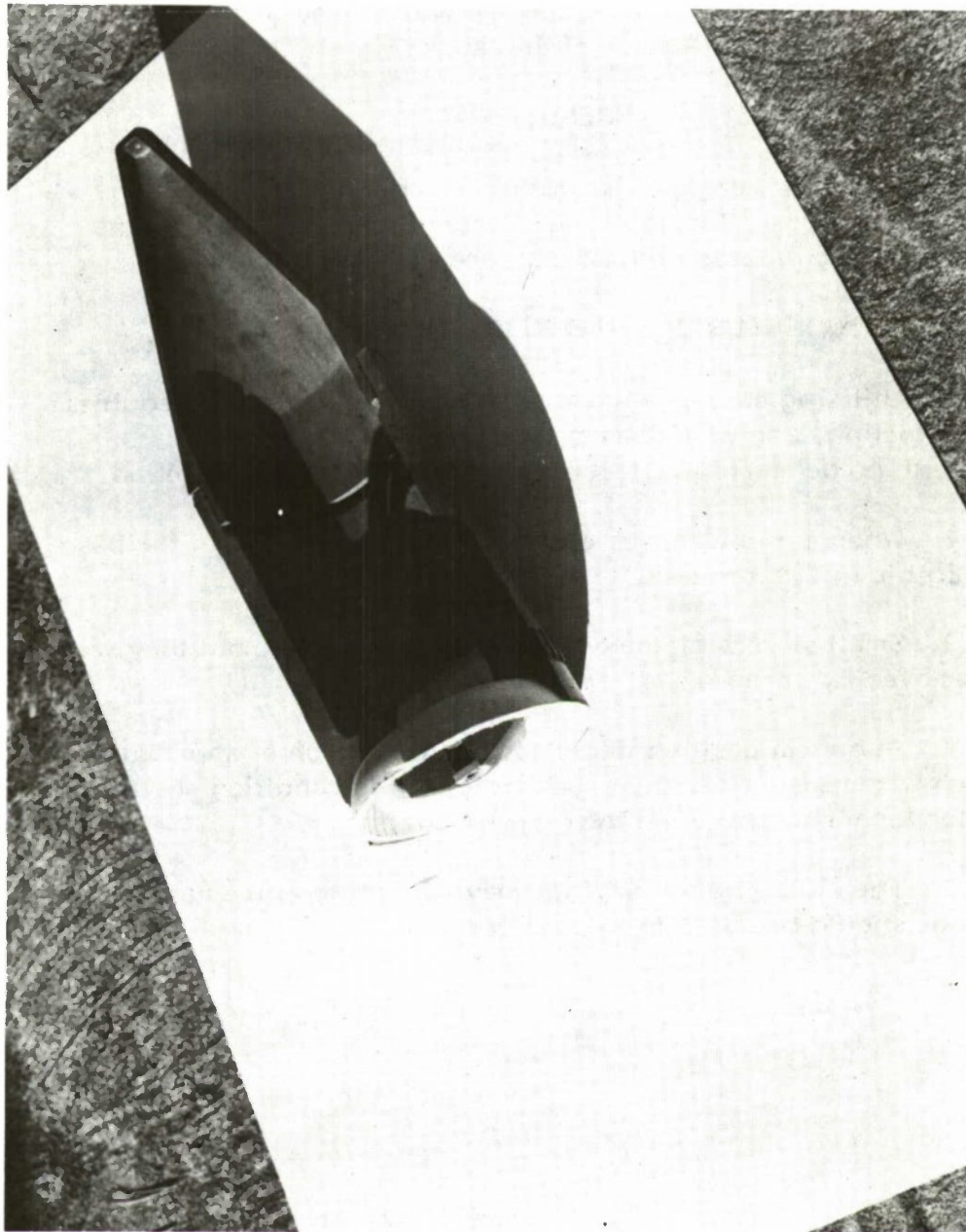
Application of the brush to the base removed the epoxy and case material in approximately 60 seconds. The brush did not load, and the resultant slurry was retained in a plastic shroud, placed around the cutting area (see Figs 4, 5, 6). The brush was bottomed at 45 seconds after initial contact. At the bottomed position, the brush was oscillated approximately .060 inch for 15 seconds by the cross slide of the lathe (Fig 6).

RESULTS

Five rounds were cleaned in this manner (Fig 7), with no evidence of wear on the brush. The effects of long production runs on the life or effectiveness of the brush are not known at this time.

CONCLUSIONS AND RECOMMENDATIONS

1. Utilizing an appropriate wire brush is effective, requires no special tooling, and will clean projectile bases within sixty seconds with no deleterious effect on the adjacent threaded section.
2. When using water as coolant, temperature rise of the base was negligible in this process.
3. Small slivers of epoxy remained in the base, but they were easily removed by scraping with a chisel.
4. At bottom position under load, a deflection of approximately 0.100 inch was measured at the brush head. This condition should be studied for long-run effects on the grinder shaft.
5. The slurry, after drying, may constitute a fire hazard, and precautions should be taken in this respect.



Note: Curved section of projectile base supporting case.

Fig 1 Sectional projectile with dome of M157 nonmetallic cartridge case



Fig 2 Milwaukee wire cup brush, 5 inch diameter

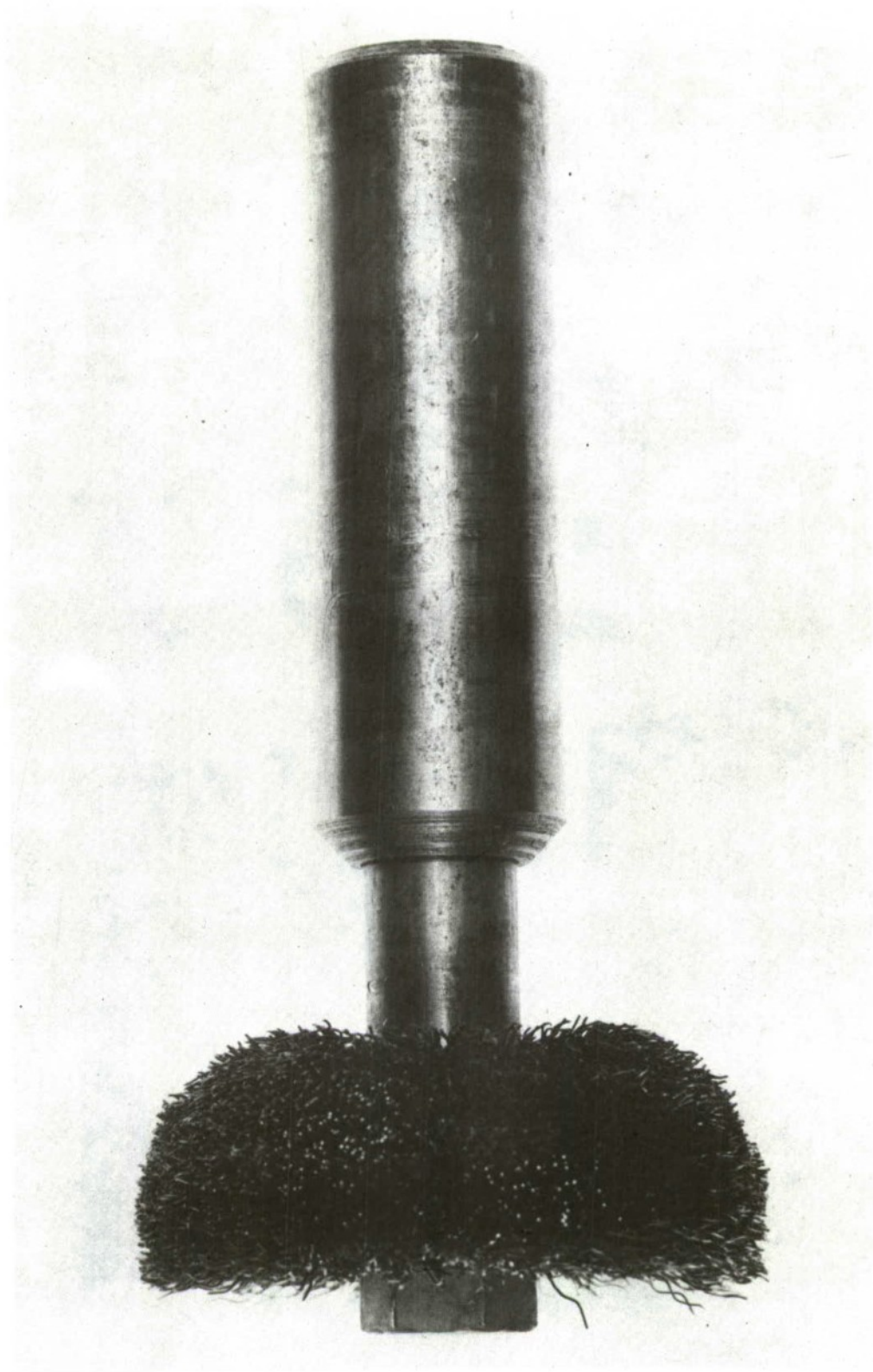


Fig 3 Wire brush contoured to projectile base profile



Fig 4 Position of brush and projectile prior to operation

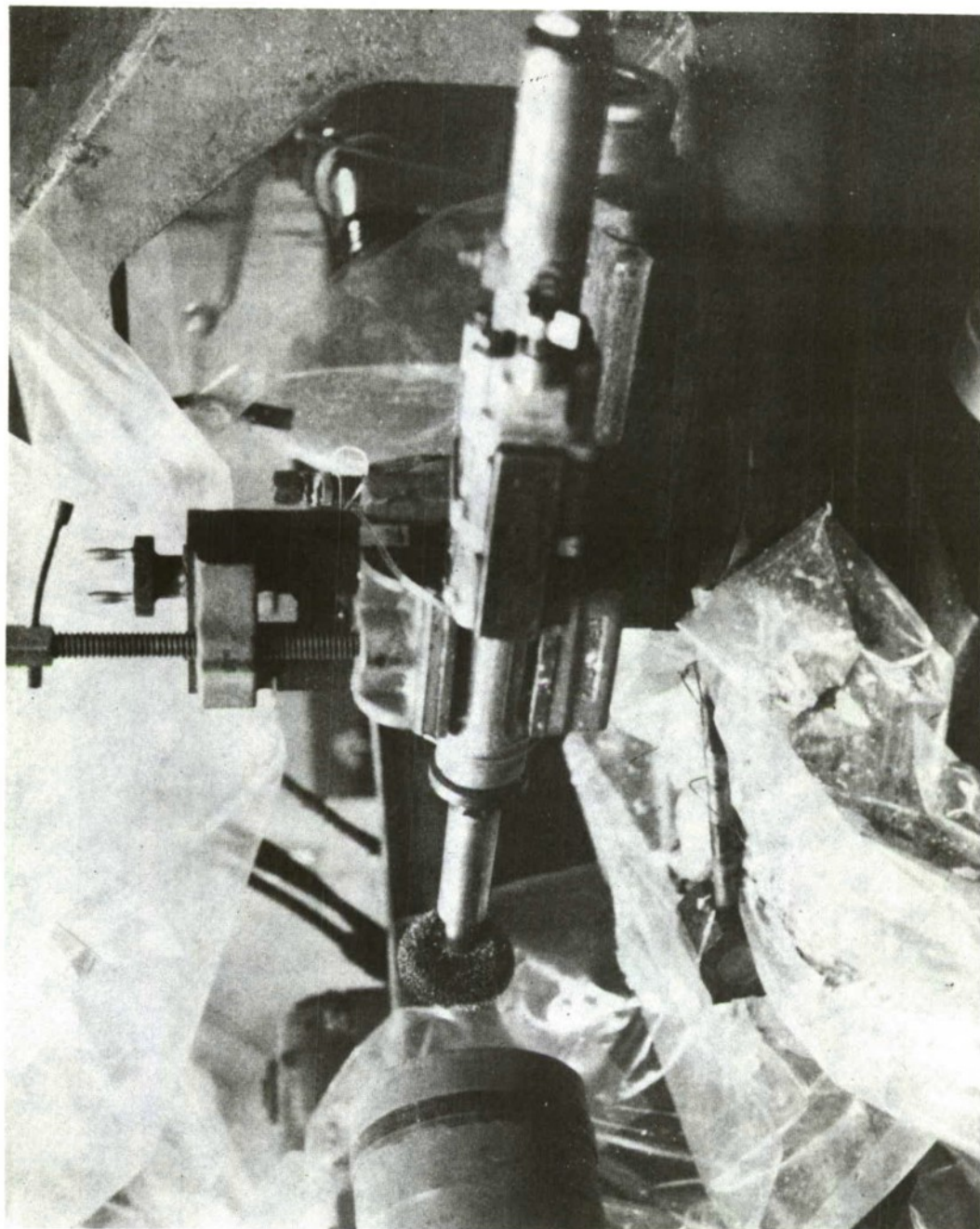


Fig 5 View of brush from operator's position, note plastic shroud

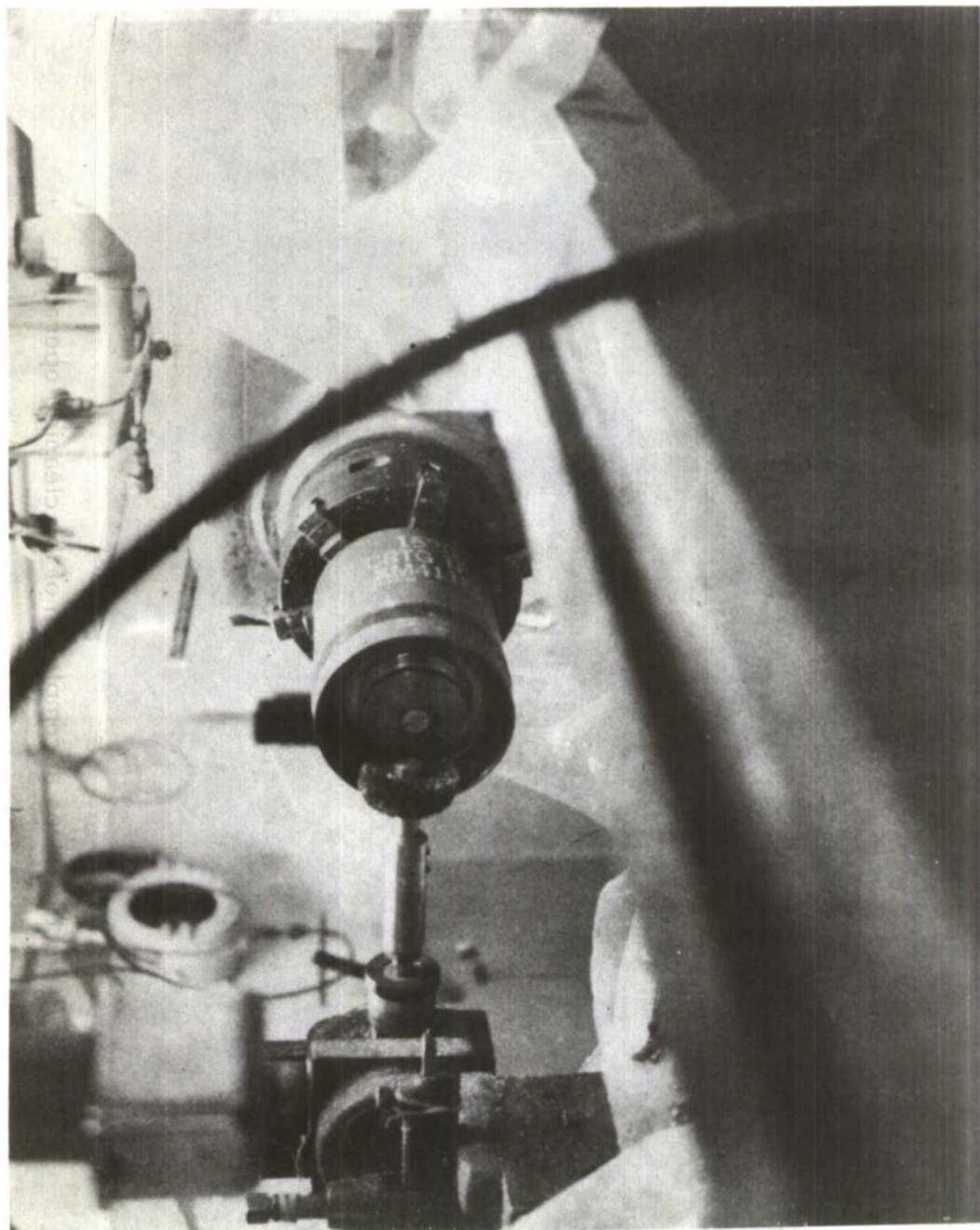


Fig 6 Brush in operating position

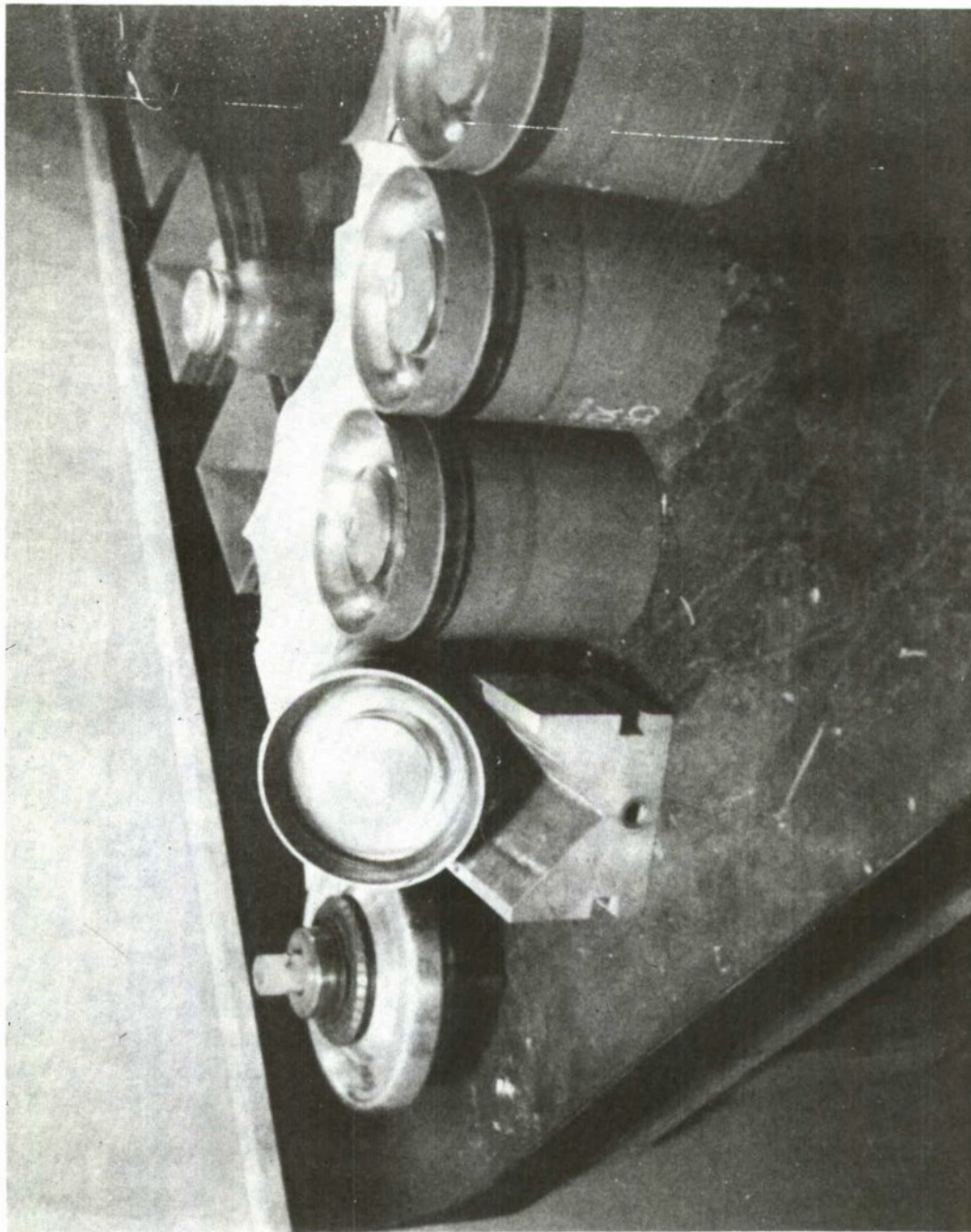


Fig 7 Projectile bases at completion of the cleaning operation

APPENDIX

15 March 1974

METHOD IN USE TO REMOVE CASE MATERIAL AT IAAP

1. Remove projectile from package and place nose down on skid.
2. Break base free from cartridge case with chisel.
3. Remove base, initiator, primer, and propellant from case.
4. Cut case with pipe cutter flush with rear face of projectile body, leaving epoxied dome in rear of projectile.
5. Hand chip away case material using non-sparking chisel, then if necessary pour epoxy stripper MS-110 into the base enough to saturate the case material. Continue until all prepared projectiles are so treated.
6. Approximately 30 minutes after application of stripper to the projectile base, clean projectile scraping away from case material with a putty knife and follow up with a clean rag. The projectile is now ready for the M205 case assembly.

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